REMARKS/ARGUMENTS

Remarks concerning amendments to claims

Claims 1-18 are pending. Claims 1, 5, 7, 9, and 16 are amended.

Response to rejections — 35 USC 112

Claim 5 is amended to remove indefinite terms of degree.

Claim 7 is amended to replace "ns" with "nanosecond". Applicant makes note for the record that the International System (SI) of units, which is universally recognized in the sciences and adopted by the USPTO (MPEP 608.01, part IV), clearly defines the unit "ns" as the unique and unambiguous designation for one nanosecond, i.e., exactly 10^{-9} seconds.

Regarding the reference to "InGaAs/InP" in claim 15, Applicant submits that this standard chemical formula "InGaAs/InP" is an inherently generic term unambiguously refering to a chemical material composed of the elements In, Ga, As, and P. (See, for example, US Pat. 5053837 and US Pat. 5684308.) Thus, "InGaAs/InP" is a clear and definite term in the art, and the claim is not indefinite. Moreover, the Office has not made of record any factual evidence supporting the allegation that "InGaAs/InP" is a trademark recognizable within the field of the invention. Absent specific information or references to such evidence (MPEP 707), the rejection is without factual basis and Applicant is not enabled to properly respond to the rejection.

Response to rejections — 35 USC 102 and 103

Claims 1-9, 12, and 14-16 were rejected as anticipated by US Pat. No. 5,675,648 ("Townsend"). In addition, claims 10, 11, 13, 14, 17, and 18 were rejected as being unpatentable over Townsend. However, there are several significant features recited in the claims that are neither taught nor suggested by Townsend. As explicitly stated by Townsend (col. 3, lines 16-25), the Bennet-Brassard protocol forms the basis for Townsend's system. This protocol, and Townsend's system in particular, is fundamentally different from the claimed technique in several significant respects, as will now be explained.

Single Photon vs. Photon Pair

In Townsend's system, "the quantum channel is encoded on a ***single-photon*** optical signal" (col. 2, lines 25-26). In contrast, the claimed invention ***sequentially*** generates a ***pair*** of photons using a ***regulated*** photon source. Townsend does not disclose the use of a regulated photon source or the use of such a source to sequentially generate pairs of photons. In fact, Townsend actually teaches away from a regulated photon generator that sequentially generates two photons of a pair: "The quantum channel uses pulses containing ***at most one photon***" (col. 5, lines 10-11).

Modulated Phase vs. Random Relative Phase

Townsend's technique is "based upon a single photon Mach-Zehnder interferometer" (col. 3, lines 26-27). "In the transmitter, individual photons pass through a ***phase modulator***" (col. 3, lines 28-29). As shown in Figs. 1 and 2, Townsend's transmitter (1) uses a phase modulator to split a single photon into components having a definite ***phase relation*** $\pm\phi$. Thus, while Townsend generates a single photon and splits it into ***phase-related*** components, the claimed invention sequentially generates two photons that ***have random phase relationship***. In Townsend's system, the relative phase is introduced in a controlled manner by the phase modulator. In contrast, the two photons in the claimed invention are generated with random relative phase, i.e., they are not generated with any specific phase relationship, and there is no phase modulator in the transmitter. It is important to emphasize the significant difference between Townsend's ***controlling*** the relative phase between components of one photon by randomly switching a phase modulator between different encoding alphabets (col. 3, lines 28-32) and the claimed technique of ***generating*** two photons with a random phase relationship, i.e., without controlling their relative phase.

Regulated Generation vs. Path Length Difference

Townsend's system interleaves the split components of the single photon "with a time delay which is set by the path length difference" (col. 4, lines 18-19). In contrast, the claimed invention sequentially generates two photons that are separated by a regulated time interval Δt. There is a fundamental difference between sequentially generating two distinct photons separated by a regulated time interval and introducing a time delay between phase related components of a

single photon. In one case, a regulated photon source is controlled to sequentially generate two photons at different times, while in the other case, a single photon is split into components, one of which is delayed by a path length difference.

Transmitter/Receiver Key vs. Receiver/Receiver Key

Although Townsend's system (Fig. 6) has a transmitter and two receivers. Instead, Townsend's system is used to determine ***separate*** keys between the transmitter and ***each*** receiver (col. 7, lines 9-33). As Townsend explicitly states, "Each receiver receives a different sequence of bits" (col. 7, line 23) and "Each receiver has a different r-bit key known to the transmitter" (col. 7, lines 28-29). In contrast, the claimed method jointly determines a key at the two receivers. In other words, there are not separate keys for each receiver, but one key shared by the two receivers. This is a significant difference between the claimed method and Townsend's technique, since Townsend's system only permits each receiver to determine a key with the transmitter; it does not permit two receivers to jointly determine a shared secret key with each other. The claimed technique thus has the advantage that the distance between parties is double the distance in Townsend's system.

In view of the significant differences between the claimed invention and Townsend as described above, Applicant submits that Townsend does not, in fact, teach or suggest the invention as specifically recited in the claims. In order to make these distinctions more clear, Applicant has amended the claims to more specifically emphasize these differences. Accordingly, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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